

I claim:

1. A filter separator apparatus for removing particles and organisms from liquid comprising:

5 an inlet chamber, a separation and filter chamber, and a discharge chamber with a sludge outlet, the chambers being connected and together defining a liquid flow path;

a screen filter within the separation and filter
10 chamber, and at least one pipe defining an outlet from the apparatus for liquid passing through the screen filter;

the inlet chamber having a tangentially mounted inlet pipe to establish a helical circular motion of
15 entering liquid with the liquid accelerating in said helical motion without forming a vortex as the liquid moves along the chamber into the separation and filter chamber;

whereby particles and organisms are removed from
20 liquid in the filter and separation chamber and liquid purified of particles and organisms is discharged from the outlet pipe, and unfiltered liquid and sludge are removed from the apparatus through the sludge outlet.

25 2. An apparatus as defined in claim 1 which further includes ultra violet light for inactivating any organisms, bacteria and pathogens in purified liquid discharged from the outlet pipe.

30 3. A filter separator apparatus for removing particles and organisms from liquid comprising:

a conical inlet chamber, a separation and filter chamber, and a discharge chamber with a sludge outlet, the chambers connected along a common axis and together
35 defining a liquid flow path;

an inlet back flushing pipe, a screen filter and a lower outlet pipe aligned along said axis with the upper outlet positioned within the conical inlet chamber, the screen filter within the separation and filter chamber,
5 and the lower outlet pipe within the discharge chamber;

the conical inlet chamber having a tangentially mounted inlet pipe to establish a helical circular motion of entering liquid with the liquid accelerating in said helical motion without forming a vortex as the liquid
10 moves along the conical chamber into and through the separation and filter chamber;

whereby particles and organisms of specific gravity greater than that of the liquid are carried by the liquid through the separation and filter chamber into the
15 discharge chamber to the sludge outlet, and particles and organisms of specific gravity near to that of the liquid are filtered from liquid passing through the filter screen so that liquid purified of particles and organisms is discharged from one of the upper and lower outlet
20 pipes depending on the installation concept.

4. A filter and separator apparatus as defined in claim 3 in which the upper and lower outlet pipes are each fitted with an outlet control valve for controlling
25 flow of liquid from the apparatus; providing for back flush of liquid to purge the filter screen; and to maintain a discharge pressure head on the sludge outlet.

5. A filter and separator apparatus as defined in claim 3 in which a flow restrictor is positioned between the filter and separator chamber and discharge chamber to reduce liquid turbulence and back flow.

6. An apparatus as defined in claim 3 which further
35 includes ultra violet light for inactivating any

organisms, bacteria and pathogens in purified liquid discharged from the outlet pipe.

5 7. A filter separator system for removing particles and organisms from liquid comprising:

a pump and a normally open first control valve for controlling inlet of fluids to the system;

10 an inlet chamber, a separation and filter chamber, and a discharge chamber with a sludge outlet, the chambers being connected and together defining a liquid flow path;

a screen filter within the separation and filter chamber, and first and second pipes defining outlets from the system for liquid passing through the screen filter;

15 the inlet chamber having a tangentially mounted inlet pipe to establish a helical circular motion of entering liquid with the liquid accelerating in said helical motion without forming a vortex as the liquid moves along the chamber into the separation and filter chamber;

20 a normally closed second control valve when open for directing inlet fluids through one of said outlet pipes for back flush of the screen filter;

25 a third control valve in the other of said outlet pipes for maintaining a back pressure on the system;

a fourth control valve for regulating sludge discharge;

30 whereby particles and organisms are removed from liquid in the filter and separation chamber and liquid purified of particles and organisms is discharged from the outlet pipe, and unfiltered liquid and sludge are removed from the apparatus through the sludge outlet.

35 8. A filter and separator system as defined in claim 7 which further comprises a first flow meter positioned

at the pump outlet and a second flow meter positioned at the sludge outlet for regulating flow through the system.

9. A filter separator system for removing particles
5 and organisms from liquid comprising:

a pump and a normally open inlet control valve for controlling inlet of fluids to the system;

an inlet chamber, a separation and filter chamber,
and a discharge chamber with a sludge outlet, the
10 chambers being connected and together defining a liquid flow path;

a screen filter within the separation and filter chamber, and first and second pipes defining outlets from the system for liquid passing through the screen filter;

15 the inlet chamber having a tangentially mounted inlet pipe to establish a helical circular motion of entering liquid with the liquid accelerating in said helical motion without forming a vortex as the liquid moves along the chamber into the separation and filter
20 chamber;

a water accumulation tank and control valve connected to one of said inlet back flushing pipes for water back flush of the filter separator;

an air accumulation tank and control valve connected
25 to one of said outlet pipes for air scrubbing of the filter separator;

a back pressure control valve in the outlet pipe for maintaining a back pressure on the system;

a sludge control valve for regulating sludge
30 discharge;

whereby particles and organisms are removed from liquid in the filter and separation chamber and liquid purified of particles and organisms is discharged from the outlet pipe, and unfiltered liquid and sludge are
35 removed from the apparatus through the sludge outlet.

10. A filter and separator system as defined in claim 9 which further comprises a first flow meter positioned at the pump outlet and a second flow meter
5 positioned at the sludge outlet for monitoring and regulating flow through the system.

11. A filter separator system for removing particles and organisms from liquid comprising:

10 a pump and a normally open inlet control valve for controlling inlet of fluids to the system;

an inlet chamber, a separation and filter chamber, and a discharge chamber with a sludge outlet, the chambers being connected and together defining a liquid
15 flow path;

a screen filter within the separation and filter chamber, and first and second pipes defining inlet and outlet from the system for liquid passing through the screen filter;

20 the inlet chamber having a tangentially mounted inlet pipe to establish a helical circular motion of entering liquid with the liquid accelerating in said helical motion without forming a vortex as the liquid moves along the chamber into the separation and filter
25 chamber;

a normally closed inlet control valve when open for directing inlet fluids through one of said outlet pipes for back flush of the screen filter;

30 a water accumulation tank and control valve connected to one of said outlet pipes for water back flush of the filter separator;

an air accumulation tank and control valve connected to one of said outlet pipes for air scrubbing of the filter separator;

35 a back pressure control valve in the other of said

outlet pipes for maintaining a back pressure on the system;

a sludge control valve for regulating sludge discharge;

5 whereby particles and organisms are removed from liquid in the filter and separation chamber and liquid purified of particles and organisms is discharged from the outlet pipe, and unfiltered liquid and sludge are removed from the apparatus through the sludge outlet.

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12. A filter and separator system as defined in claim 11 which further comprises a first flow meter positioned at the pump outlet and a second flow meter positioned at the sludge outlet for monitoring and
15 regulating flow through the system.

13. A method of removing particles and organisms from liquid comprising the steps of:

establishing a low pressure flow of liquid;

20 directing the flow of liquid in a helical circular motion without creating a vortex;

accelerating the helical circular motion of liquid to separate particles and organisms having a specific gravity greater than the liquid;

25 passing the flow of liquid through a filter to screen out particles and organisms having a specific gravity near to that of the liquid;

30 discharging as sludge the separated and filtered particles and organisms together with a portion of liquid; and

discharging the remaining flow of liquid free of separated and filtered particles and organisms.

14. A method according to claim 13 which includes
35 the step of purging the filter.

15. A method according to claim 13 which includes the step of purging the filter by back flushing with liquid.

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16. A method according to claim 13 which includes the step of purging the filter by back flushing with air.

17. A method according to claim 13 which includes the step of maintaining a back pressure on the liquid flow.

18. A method according to claim 13 which includes the steps of metering the established flow of liquid; metering the discharge of sludge; and using a ratio of the metered values to control volume of liquid flow.

19. A method according to claim 13 which includes the step of subjecting discharged liquid to ultraviolet light to inactivate any organisms, bacteria and pathogens in the liquid.

20. A method of removing particles and organisms from liquid comprising the steps of:

25 establishing a low pressure inflow flow of liquid;
directing the flow of liquid in a helical circular motion without creating a vortex;

accelerating the helical circular motion of liquid to separate particles and organisms having a specific gravity greater than the liquid;

30 passing the flow of liquid through a filter to screen out particles and organisms having a specific gravity near to that of the liquid;

collecting in a chamber a sludge of the separated and filtered particles and organisms together with a

portion of liquid;

regulating the internal pressure of the sludge chamber to achieve a sludge flow which is up to 10% of the main flow;

5 discharging the remaining flow of liquid free of separated and filtered particles and organisms; and

subjecting discharged liquid to ultraviolet light in a wave length between 215-315 nm to inactivate any organisms, bacteria and pathogens in the liquid.

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